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(54) MIRROR TYPE AND DUAL ROUTER DEVICE

(57) Abstract

The present invention pertains to routers that are used for Internet communication utilizing an Internet protocol. The router device (10) of the present invention consists of two routing control parts (123, 124) and (223, 224) and switches (121, 222) and (221, 222) respectively in control parts (12) and (22). These routing control parts (123, 124) and (223, 224) are respectively connected to their LAN switches (11) and (21) and LAN switches (11, 21) of other routers (10) and (20) through the switches (121, 122) and (221, 222) and selectively mediate communication of their hosts (H11-H1n) and (H21-H2n) and other hosts (H11-H1n) and (H21-H2n) in accordance with switching of the switches (121, 122) and (221, 222).

In other words, in the present invention, in case an abnormality occurs in one router, since a switching process for mediating communication utilizing another router is present in terms of hardware, high-speed switching is possible, so that communication interruptions due to a time delay or a delay in service time do not occur.

Representative figure:

Figure 2

Specification

Brief description of the figures

Figure 1 shows a state in which communication is carried out between hosts through an Internet network utilizing conventional routers.

Figure 2 is an outlined block diagram showing the mirror type router device of the present invention.

Figure 3 is an outlined block diagram showing the dual router device of the present invention.

Explanation of symbols in the main parts of the figures

H11-H1n, H21-H2n	Hosts
10, 20	Routers
11, 21	LAN switches
12, 22	Control parts
13, 23	Output parts
121, 122, 221, 222	Switches

Detailed explanation of the invention

Purpose of the invention

Technical field of the invention and prior art of the field

The present invention pertains to routers that are used in Internet communication utilizing an Internet protocol. More specifically, the present invention pertains to mirror type and dual router devices in which the other router can continuously carry out communication when an abnormality occurs.

In Internet communication utilizing an Internet protocol, routers are used as the means for mediating communication between hosts. In other words, as shown in Figure 1, a host (H1) accesses an Internet network (3) through routers (R1) and (R2) and can communicate with the desired external host (H2) through the Internet network (3). In other words, when host (H1) passes through router (R1), it communicates with host (H2) through a prescribed path of the Internet network (3) and a router (R3). On the other hand, host (H1) can communicate with host (H2) through router (R2), and in this case, the host passes through a prescribed path of the Internet network (3) and a router (R4) different from the case where the host passes through router (R1).

On the other hand, during communication through a router (for example, R1) between host (H1) and host (H2), if an abnormality occurs in router (R1), communication between hosts (H1, H2) can potentially be interrupted, and a software protocol such as HSRP (Hot Swappable Routing Protocol) is utilized to prevent such an interruption in communication. With the HSRP protocol, a virtual router is arranged between two routers (R1, R2), and a method in which host (H1) communicates with host (H2) through the virtual router is adopted. In case host (H1) carries out communications through the virtual router, active/standby states are discriminated between routers (R1, R2), and router (R1/R2) in active state communicates with host (H2) instead of the virtual router. The routers in active/standby states are discriminated by prioritizing which router (R1/R2) is operated in active state.

Router (R1/R2) in active state informs the other router (R2/R1) of the active state by transferring a hello message, and if an abnormality occurs during operation in standby state, a

resign message is transferred. If the resign message is transferred from the active router, the router with the higher priority of routers (R2/R1) which operate in standby state is changed to active state and communicates with host (H2) instead of the virtual router. The router that has changed from standby to active informs the other router of the change to active state by transferring a Coup message.

As mentioned above, in the method utilizing the HSRP protocol, in order for an abnormality in the router in active state to be detected by the other routers, since messages must be continuously exchanged between the routers, much time is required to detect change in active/standby state, and a load is generated in accordance with the mutual message transfer. In addition, in the conventional method utilizing the HSRP protocol, routing table information of the router in active state must be updated in the router going from standby to active state; considerable time is required for this process.

The time requirement, which is due to this change in active/standby state , means that communication between the hosts cannot be carried out for a certain period of time, lowering the Internet communication speed. In case an interruption in communication continues for a prescribed time or longer over the Internet, since the communication path between them is automatically cut off, the communication is also cut off.

Technical problems to be solved by the invention

The present invention solves these problems, and its purpose is to provide a mirror type router device in which two routers mediate communication between hosts and can continuously carry out communication with an external host when an abnormality occurs.

Another purpose of the present invention is to provide a dual router device in which the communication reliability of hosts is secured by a constitution of two routers.

In order to achieve these purposes, according to the present invention, in relation to routers for mediating Internet communication between hosts through an Internet network, the routers are equipped with an output part consisting of multiple interface units which interface with an Internet network, an LAN switch is connected between the hosts and carries out multicast switching, and a control part constituted between the interface units of the output part and the LAN switch are constituted as a pair of first and second routers. The control part is equipped with first and second routing control parts for controlling routing of packets of the aforementioned hosts in accordance with routing table information, a first switch for selectively connecting the first routing control part and the LAN switch, and a second switch for selectively connecting the second routing control part and the LAN switch of an external router, and the control parts in the first and second routers communicate with each other and control switching of the first and second switches.

According to the present invention, in relation to routers for mediating Internet communication between hosts through an Internet network, the routers are equipped with an output part consisting of multiple interface units which interface with an Internet network, a LAN switch is connected between the hosts and carries out multicast switching, and a control part constituted between the interface units of the output part and the LAN switch dually constitute first and second routers. The first and second routers are connected to the same hosts, the control part in the routers is equipped with first and second routing control parts for controlling routing of packets of the aforementioned hosts in accordance with routing table information, a first switch for selectively connecting the first routing control part and the LAN switch, and a second switch for selectively connecting the second routing control part and the LAN switch of the other side router; the control parts in the first and second routers communicate with each other and control switching of the first and second switches.

Constitution and operation of the invention

Next, with reference to the attached figures, an application example of the present invention will be explained in detail.

Figure 1 [sic; 2] is an outlined block diagram showing the mirror type router device of the present invention. As shown in the figure, routers (10) and (20) each access an Internet network (3) and mediate communication among multiple hosts (H11-H1n, H21-H2n) and the network (3).

Routers (10) and (20) are equipped with LAN switches (11) and (21), control parts (12, 22), and output parts (13, 23), and the LAN switches (11) and (21) are connected to hosts (H11-H1n, H21-H2n) and selectively connect hosts (H11-H1n, H21-H2n) and the control parts (12) and (22).

In the control parts (12) and (22) of routers (10) and (20), as shown in the figure, switches (121, 122) and (221, 222) and routing control parts (123, 124) and (223, 224) are respectively constituted, and the switches (121, 122) and (221, 222), as will be mentioned later, are selectively switched in accordance with the control of the control parts (12, 22).

The routing control parts (123, 124) and (223, 224) route packets, which are provided through the LAN switches (11) and (21) and the output parts (13) and (23), in accordance with information in a routing table not shown in the figure and provide the packets to link interface units (L11-L14) and (L21-L24) or LAN switches (11) and (21).

The link interface units (L11-L14) and (L21-L24) of the output parts (13) and (23) interface with Internet network (3) and control parts (12) and (22).

With the above constitution, it can be understood that LAN switch (11) is provided with a first path, which is connected to control part (12), and a second path, which is connected to control part (22), whereas the LAN switch (21) is provided with a third path, which is connected

to control part (12), and a fourth route, which is connected to control part (22). Therefore, hosts (H11-H1n) and (H21-H2n) connected to LAN switches (11) and (21) are selectively connected to Internet network (3) through routing control parts (123) and (223) or (124) and (224) in accordance with the driving of switches (121, 122) and (221, 222).

Here, LAN switches (11) and (21) provide a LAN switch state information signal for informing an abnormality to control parts (12) and (22), and output parts (13) and (23) provide an LIU state information signal for informing the occurrence of an abnormality in LIU (L11-L14) and (L21-L24) to control parts (12) and (22). Control parts (12) and (22) can detect an abnormality and provide a LAN switch state information signal and an abnormality detection result of control parts (12) and (22) to control parts (12) and (22) of external routers (10) and (20). In addition, control parts (12) and (22) selectively control switching of switches (121, 122) and (221, 222) in accordance with the LIU state information signal, the abnormality detection result of the control parts (12) and (22), the external LIU state information signal from external routers (10) and (20), and the abnormality detection result of external control parts (12) and (22). In other words, when control parts (12) and (22) and output parts (13) and (23) are normally driven, the control parts turn on switches (121) and (221) to interconnect hosts (H11-H1n) and (H21-H2n) and the routing control parts (123) and (223), so that hosts (H11-H1n) and (H21-H2n) can carry out communication through Internet network (3). However, in case an abnormality occurs in control parts (12) and (22) or output parts (13) and (23), switches (122) and (222) are turned on to interconnect hosts (H11-H1n) and (H21-H2n) of external routers (10) and (20) and routing control parts (123) and (223), so that hosts (H11-H1n) and (H21-H2n) can carry out communication through Internet network (3).

On the other hand, control parts (12) and (22) each access a table server (30), and routing information required for communication is stored on table server (30). If necessary, the internal routing table information is updated with this routing information and used.

In the present invention with the above constitution, in case communication of hosts (H11-H1n) and (H21-H2n) cannot be supported because of an abnormality in output parts (13) and (23) and control parts (12) and (22) in routers (10) and (20), external routers (12) and (22)[sic; (10) and (20)] can continuously support communication in hosts (H11-H1n) and (H21-H2n). For example, when router (10) is operating normally, since switch (121) in router (10) is turned on and switch (122) is turned off, hosts (H11-H1n) can carry out communication through the first path.

However, for example, in case a situation in which router (10) cannot support communication of hosts (H11-H1n) due to an abnormality occurring in output part (13) or control part (12) in router (10), the control part (12) turns off switch (121) and provides an abnormality detection signal to the control part (22) of router (20). Control part (22) turns on

switch (222) in accordance with the abnormality detection signal to interconnect the LAN switch (11) and the routing control part (224) through the second path. On other hand, the control part receives the routing table information of the control part (12) stored on table server (30) and mediates communication between hosts (H11-H1n) according to this table.

In the above explanation, though only the case where an abnormality occurs in router (10) has been shown, it can be easily understood that if an abnormality occurs in router (20) , switch (122) in router (10) is turned on and packets of hosts (H21-H2n) are routed through the routing control part (124).

As mentioned above, though routers (10) and (20) do not have a dual constitution, when an abnormality occurs in external routers (10) and (20) , since the routers mediate communication of hosts (H11-H1n) and (H21-H2n) instead of external router (10), these routers are called mirror type hosts in this specification.

On the other hand, in the application example of Figure 2, when an abnormality occurs in LAN switches (11) and (12) , there is no countermeasure to the abnormality. In other words, in case LAN switches (11) and (21) are not operated, the paths among hosts (H11-H1n) and (H21-H2n) and the controls parts (12) and (22) are cut off, routers (10) and (20) cannot route packets of hosts (H11-H1n) and (H21-H2n).

The present inventor has solved these problems by constituting the routers as shown in Figure 3. In other words, as shown in Figure 3, two routers (10) and (20) are accessed in parallel to hosts (H11-H1n), and LAN switches (11) and (21) in routers (10) and (20) are respectively connected to their control parts (12) and (22) and external control parts (22) and (12). In control parts (12) and (22), as shown in the figure, routing control parts (123, 124) and (223, 224) and switches (121, 122) and (221, 222), and routing control parts (123, 124) and (223, 224) and LAN switches (11) and (21) are selectively connected in accordance with the switching of switches (121, 122) and (221, 222). In the control parts (12) and (22), routing tables (125) and (225) are also respectively constituted, and routing tables (125) and (225) input the external information to be able to update their routing tables.

With the above constitution, the LAN switches (11) and (21) provide a LAN switch information signal for informing their abnormality to control parts (12) and (22), and output parts (13) and (23) provide an LIU state information signal for informing an abnormality in LIU (L11-L14) and (L21-L24) to the control parts (12) and (22). Control parts (12) and (22) respectively receive an abnormality signal of controls (12) and (22), their LAN switch state information signal and LIU state information signal, and the external LAN switch state information signal and LIU state information signal from the external routers (10) and (20), and an abnormality signal of the external control parts (12) and (22) and control the switching state of switches (121, 122) and (221, 222) in accordance with these signals.

The switching control method for switches (121, 122) and (221, 222) will be explained as follows. First, routers (10) and (20) of Figure 3 have a dual constitution, and these routers are selectively operated in active/standby states. The case where router (10) is operated in an active state and router (20) is operated in a standby state will be explained as an example.

In case router (10) is operating normally, that is, in case LAN switch (11), control part (12), and output part (13) are operating normally, the control part (12) in an active state turns on the switch (121) and turns off the switch (122) to route packets from hosts (H11-H1n) to the corresponding LIU (L11-L14). At that time, since router (10) is normal, control part (12) does not provide an abnormality detection signal to router (20). Therefore, router (20) in standby state maintains switches (221, 222) in off state.

However, in case an abnormality occurs in LAN switch (11) of router (10), control part (12) detects the abnormality in LAN switch (11) by LAN switch abnormality state information signal from LAN switch (11) and turns off switch (121) and turns on the switch (122). Therefore, LAN switch (21) of router (20) and router control part (124) of router (10) are accessed through switch (122), router (10) can continuously route the packets of hosts (H11-H1n).

Next, in case an abnormality occurs in the output part (13) of router (10), control part (12) of router (10) informs control part (22) of router (20) of an abnormality detection signal and turns off switches (121, 122).

After detecting the abnormality in output part (13) of router (10) by the abnormal detection signal from router (10), control part (22) turns on switch (222) to interconnect LAN switch (11) and routing control part (224), continuously mediating the communication of hosts (H11-H1n). At that time, since the routing information for mediating the communication of hosts (H11-H1n) is read from the routing table (125) and stored in the routing table (225), the continuity of this routing information is maintained.

In addition, in case LAN switch (11) and output part (13) of router (10) simultaneously operate abnormally or control part (12) operates abnormally, control part (12) turns off switches (121, 122), informs LAN switch (11) and output part (13) of the abnormality, and/or informs control part (22) of router (20) of the abnormality in control part (12) itself. Control part (22) of router (20) thus turns on switch (221) to interconnect LAN switch (21) and routing control part (223), continuously mediating the communication of hosts (H11-H1n). At that time, since the routing information for mediating the communication of hosts (H11-H1n) is read from routing table (125) and stored in routing table (225), the continuity of this routing information is maintained.

As mentioned above, in the application example of Figure 3, even if an abnormality occurs in the LAN switch of a router, the communication between the hosts can be continuously

mediated by utilizing a router in standby state. However, in this case, the routers must have a dual constitution.

Effect of the invention

As mentioned above, according to the present invention, in case an abnormality occurs in a router, since a switching process for mediating communication by utilizing an external router is present in terms of hardware, high-speed switching is possible, preventing communication cut-off due to a time delay or a delay in service time.

Claims

1. A mirror type router device comprising routers for mediating Internet communication between hosts through an Internet network, characterized in that routers equipped with an output part consisting of multiple interface units which interface with said Internet network, a LAN switch which is connected between said hosts and carries out multicast switching, and a control part which is constituted between the interface units of said output part and said LAN switch are constituted as a pair of first and second routers, in that said control part is equipped with first and second routing control parts for controlling routing of packets of said hosts in accordance with routing table information, a first switch for selectively connecting said first routing control part and said LAN switch, and a second switch for selectively connecting said second routing control part and the LAN switch of an external router, and in that the control parts in said first and second routers communicate with each other and control switching of said first and second switches.

2. The mirror type router device of Claim 1, characterized in that a table server provided with routing information of said routers is constituted apart from said routers; and said first and second routers update internal routing tables by the routing information and carry out routing.

3. A dual router device comprising routers for mediating Internet communication between hosts through an Internet network, characterized in that routers equipped with an output part consisting of multiple interface units which interface with said Internet network, a LAN switch which is connected between said hosts and carries out multicast switching, and a control part which is constituted between the interface units of said output part and said LAN switch are dually constituted as first and second routers, in that said first and second routers are connected to the same hosts, in that said control part in said routers is equipped with first and second routing control parts for controlling routing of packets of said hosts in accordance with routing table information, a first switch for selectively connecting said first routing control part and said LAN switch, and a second switch for selectively connecting said second routing control part and

the LAN switch of an external router, and in that the control parts in said first and second routers communicate with each other and control switching of said first and second switches.

4. The dual router device of Claim 3, characterized in that said routers communicate with each other and update internal routing table information.

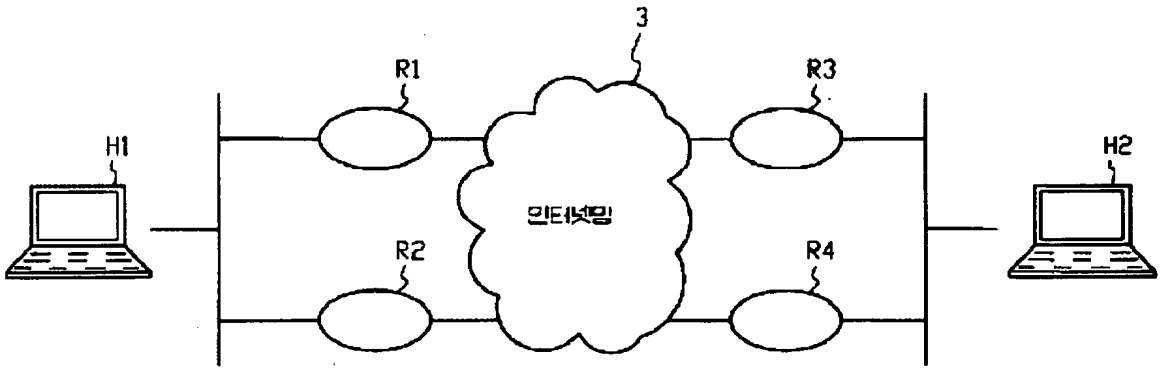

Figure 1

Key: 3 Internet network

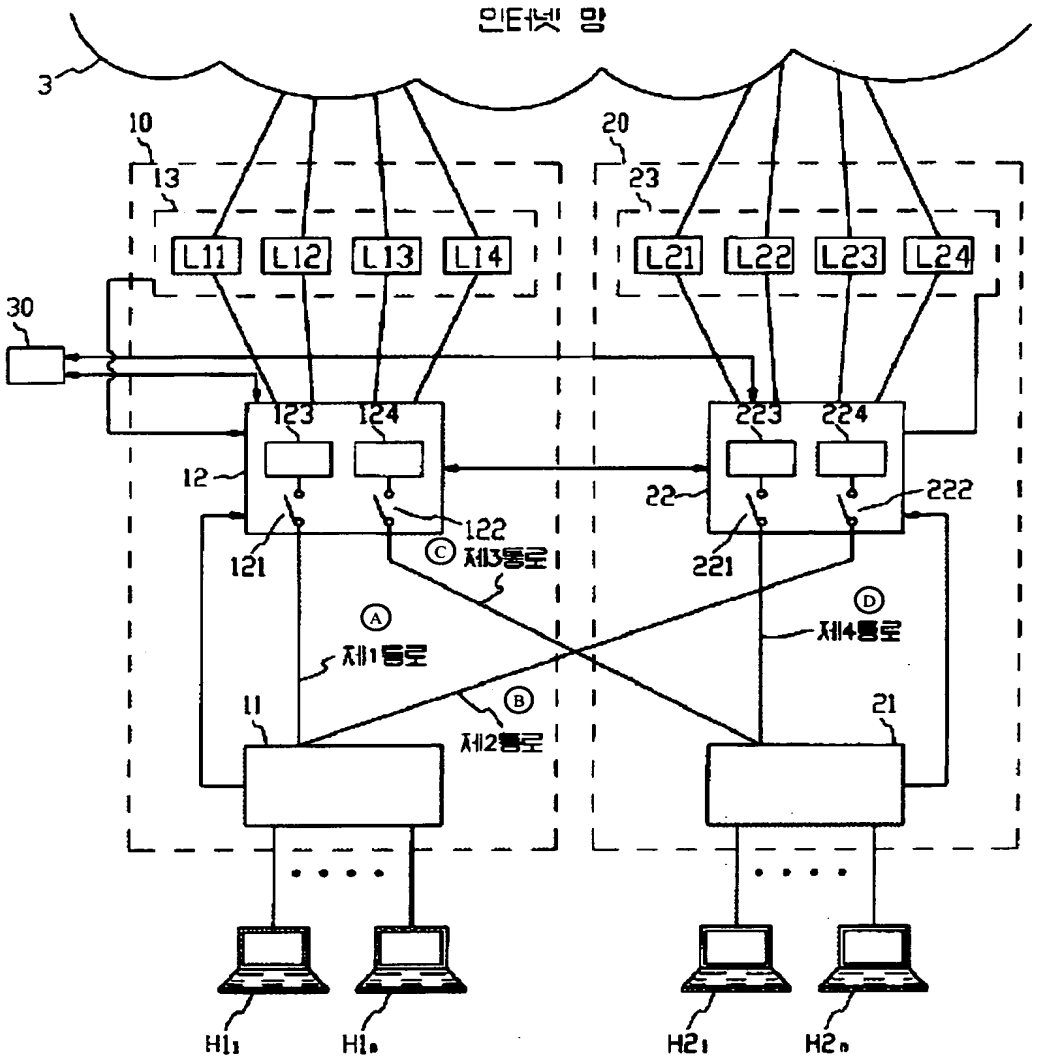

Figure 2

Key:
- A First route
- B Second route
- C Third route
- D Fourth route
- 3 Internet network

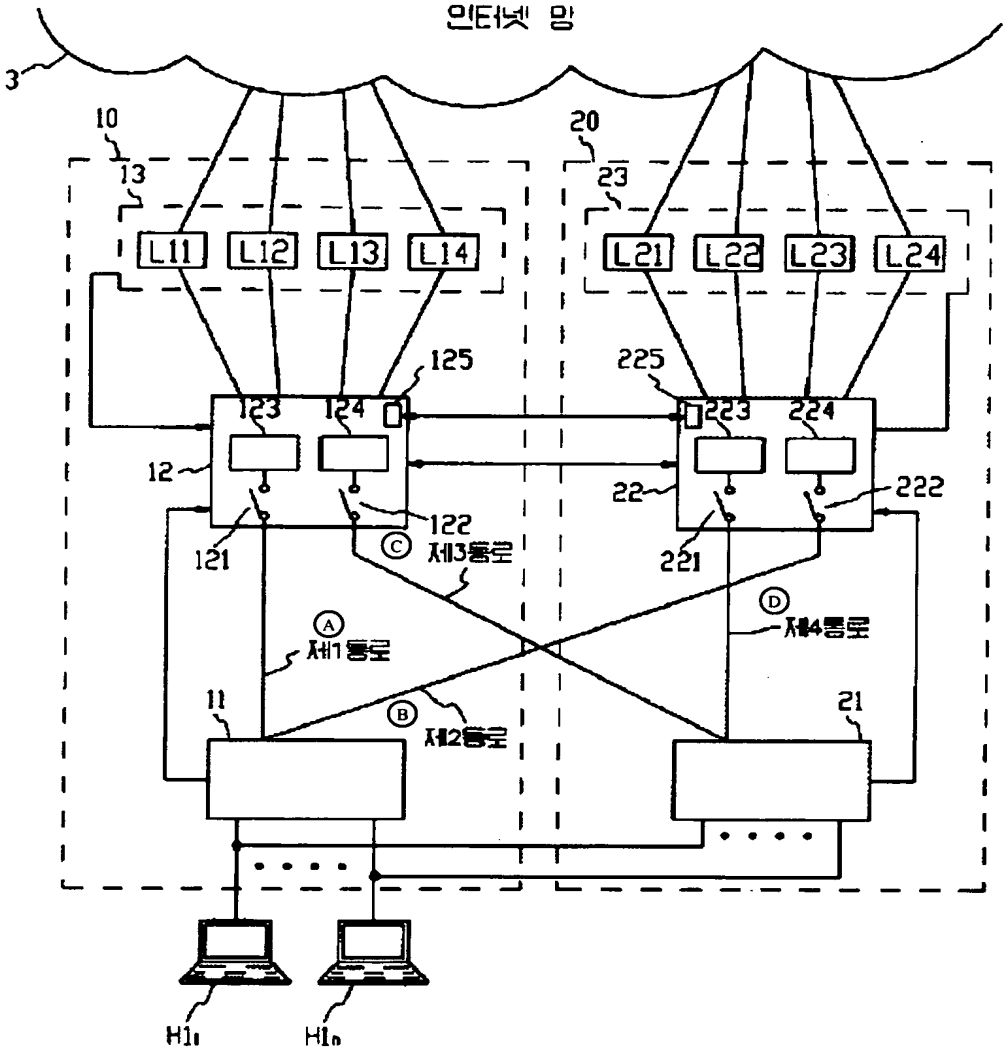

Figure 3

Key:
- A First route
- B Second route
- C Third route
- D Fourth route
- 3 Internet network